

Marcy (H. O.)

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Henry Q. Marcy.

The
Climatic Treatment of Disease :
WESTERN NORTH CAROLINA AS A
HEALTH RESORT.

BY HENRY O. MARCY, A.M., M.D.,
OF BOSTON, U. S. A.,

President of the Boston Gynaecological Society; late President of the American Academy of Medicine; Member of the International Medical Congress; Member of the British Medical Association; Corresponding Member of the Medico-Chirurgical Society of Bologna, Italy; Member of the American Medical Association; Member of the American Public Health Association; Member of the Massachusetts Medical Society; late Surgeon, U. S. A., etc.

Read before the American Academy of Medicine, New York,
October 29, 1885.



Reprinted from the *Journal of the American Medical Association*, December 26, 1885.

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THE CLIMATIC TREATMENT OF DISEASE; WESTERN NORTH CAROLINA AS A HEALTH RESORT.

Modern science invests old topics with new interest. The fundamental factors of sanitation are now so well understood that the question of climate and its influence upon health and disease may be discussed with the assurance of dealing somewhat, at least, with objective factors, instead of theory and the results of experience alone. Every student of modern medicine finds a new inspiration from the great progress already made by the indefatigable labors of a considerable number of trained workers in all the leading countries. The one object of research has been to ascertain the causes of communicable diseases.

Few will now be found to question the real profit arising from this most difficult problem of scientific research, and that, at least, a clew has been obtained leading to a knowledge of one of the most profound of nature's mysterious workings. There are many who accept it as the prophecy of a revelation to come, which shall elevate medicine from the domain of art and place it within the realm of the more exact sciences ; a knowledge of fundamental factors upon which to erect anew the Temple of Æsculapius. If a contagium vivum plays the rôle in the entire group of zymotic diseases, the study of organic decomposition is not alone a question of chemical interest, but irresistibly leads to conclusions of a biological character; and the scientist finds himself absorbed in watching life processes ;—a struggle for the survival of organisms with their environment, a conflict ending often in the destruction of the higher complex forms of animal life by a foe, so insignificant, so utterly

beyond ordinary comprehension, that it seems verily a battle with the powers and principalities of the air.

The so-called "germ theory of disease" has passed from the realm of theory into that of demonstration as fact, and based upon our present knowledge, confessedly fragmentary and imperfect, yet sufficiently exact from which to make deductions, sanitation has become in a large measure a science. From this standpoint, climatology is invested with a new interest and value, as seen especially in the contributions of the last few years. A surgically clean wound means an aseptic wound. The aphorism of Hippocrates, "pure air, pure water, pure soil," signifies now an air, water and soil free from infectious elements of disease, and this must be defined as the most important factor pertaining to a health resort, sought under the name of climate. This subject, which is far too large for the present occasion, must be epitomized in a general way, as the individual wisely adapted to his surroundings.

Life carries with it, as an inherent property, a vital, resisting power by which the individual is able to adapt himself to surroundings and overcome deleterious influences. These phenomena we call the "laws of life," beyond the limits of which life itself ceases. Thus heat, water, food, oxygen, etc., must be furnished within fixed limits. Departures from the ideal standard which we call health lessen the vital, resisting power of organs, as well as of individuals, and pave the way for the introduction of pathological factors. Nature has provided man with an armor efficient to withstand and repel the invisible foes with which he is ordinarily surrounded. An unbroken skin is a coat of mail invulnerable to his surgical foes. The steady police surveillance of the cilia of the epithelium which lines our respiratory passages is ever ready to seize and expel the intruder, be it bacillary, or any other form of atmospheric contamination. When the defenders of the castle are

disabled, then it especially behooves us to take into watchful consideration the strength and character of ourselves, as well as of our enemies.

The chemical and mechanical laws of life have, hitherto, almost entirely engaged the attention of investigators in the study of the circumfusa of the invalid. For a number of years committees from the American and British Medical Associations have been engaged in securing data for the comparison of the invasion of acute diseases with meteorological changes. Although these latter are largely x-factors in the problem, they have a much wider significance than usually supposed, since they make possible conditions not only devitalizing to the individual, but favoring in many instances the growth and development of infectious germs. The tides and changes of the great atmospheric ocean, in which we are submerged, are of the utmost significance. Its weight, as measured by the barometer, indicates the pressure which our bodies sustain. The moisture in suspension not only increases the weight, but modifies its influence upon the individual, and this is measured by the hygrometer. The changes of atmospheric temperature, as recorded by the thermometer, are of well recognized importance. The atmosphere also varies in its composition, of which, from our present standpoint of consideration, oxygen and ozone may be accepted as the most significant, since these agents materially lessen the growth and development of all the microscopic forms of plant life. From the observations of a number of our most competent physiologists, it is probable that the amount of oxygen absorbed in health does not greatly vary whether the individual is at the sea-level, or at high altitudes. If this is correct, the accepted belief of increased oxygenation of the blood from breathing an air rich in oxygen, as at the sea level, is not true.

The effect upon the individual of an ozonized atmosphere is generally conceded to be beneficial, yet,

unfortunately, less is known upon this subject than is desired; its antiseptic properties are well recognized, and its influence upon the purity of the atmosphere, if not upon the individual, is undoubted. Ozone owes its great influence to its powerful oxidizing qualities. The compounds of ammonia, phosphorus and sulphur are acted upon with great rapidity, and the odors resulting from animal decomposition are removed almost instantly. It is probably destructive to all the minute vegetable organisms, when in active development, but its effect in destroying the vitality of their spores has not yet been ascertained. This has its direct bearing upon the question of climate, since it has been pretty well determined that all the varieties of pathogenic microbes not only do not thrive, but fail to live, except within a narrow range of conditions. Pasteur has based his problem of protection from disease by the inoculation of attenuated virus of repeated cultures, upon the belief that these morbid bacteria have lost their specific effects in the presence of free oxygen—that is, these growths are anaerobic. The experiments of Ogston and Cheyne do not, however, confirm this supposition. In a series of cultures of the vaccine coccus, conducted with great care, the cocci bred true and cultivated readily, but the vaccinations which I made from the cultures were entirely without effect. A few degrees in temperature will often be sufficient to retard or destroy the development of the bacterial reproduction.

Based upon the belief that an aseptic atmosphere is of the first importance in the selection of a climate for the benefit of sufferers from a certain class of diseases, examinations of the atmosphere have been carefully made to demonstrate its purity. Miguel and Freudenreich found that microphytes were rare at 800 metres, and absolutely wanting at 2,000 metres above the sea level. For physical reasons, high altitudes have been believed to be beneficial in early phthisis, and, influenced by the later demonstrations

of a bacillary cause, this aseptic state of the atmosphere is theoretically accepted as promising good results, and sanitary stations for mountain-air treatment of consumptives have been established at several selected points in the Alps, where the comforts of home life are furnished to invalids. Of these health resorts, Davos and St. Moritz are the most popular. St. Moritz is 6,000 feet and Davos is over 5,000 feet above the sea level, and the latter has become noted for winter treatment, although the average temperature from November to March is only 23° F. The number of visitors at Davos last winter was over 1,000, and careful provision is made for home comfort. The patients are urged to be active out of doors within the limit of fatigue. Each year adds to the number of invalids resorting to these mountain sanitaria, and the statistics show good results. It should, however, be borne in mind that the cases sent to these resorts are those selected in the incipient stages of disease, and this is to be taken into the account in the deductions that the recoveries average one-fourth; also the time elapsing after the treatment has been too short to determine with accuracy the results. This pertains in criticism to the statistics of other similar localities, but it is by no means an easy task to secure satisfactory data, and such a problem can never be subjected to a mathematical analysis.

A recent medical visitor writes as follows: "I saw the well known "apostle" of Davos, Dr. Spengler, and his son-in-law, Dr. Peters, whose cordial reception I will not fail to mention here. They gave me much valuable information about Davos and its value as a health resort. They seem to aim chiefly at strengthening the general system, and the heart in particular. I do not think they make systematic use of the milk-cure or of the douche; but the methodical walks up hill form part of the curative system. Consumptive patients are benefited by their stay here if

the heart be in good functional order, and if they have still a certain amount of strength. Erethic, or very weak patients, sometimes lose their sleep as soon as they are here; and, unless they regain it after the first few days of acclimatization, they do better to leave the place altogether. Davos seems to be favorable also in the case of torpid, scrofulous patients who want a bracing and exciting atmosphere, for non-irritable anaemics, debilitated and convalescent subjects. The fear of tuberculous infection in these large sanitaria may keep away a number of such patients until special hotels have been opened for non-tuberculous persons. I spoke with our professional brethren on the occurrence of haemoptysis; and was told that it was by no means more frequent here than in the plain. In a pamphlet, 'Die Landschaft Davos,' I find the following instructive data given by Dr. Spengler himself: 'Out of 323 patients, 178 never had haemoptysis, either at home or here (in Davos); 126 had haemoptysis at home, and none here; sixteen had it both there and here; three first had it here.' These figures speak very plainly for themselves."

In America we are indebted to the indefatigable labors of Dr. Charles Denison, of Colorado, far more than to any other person, for his masterly study of the Rocky Mountain regions as health resorts.

Granting that consumption is dependent upon the development of a bacillus within the lung, what may we legitimately expect from climate for its destruction or expulsion? Its propagation, so far as we now know, is dependent upon a proper soil, which means the furnishing of suitable nutriment in the form of albuminoids, a continuous temperature, and a proper amount of moisture. These supplied, the bacilli reproduce abundantly externally to the individual, and that they do not in any manner lose their pathogenic qualities is shown by their ready reproduction and development, following inoculation, causing the death of healthy animals.

Do climatic changes modify these factors? Much has been claimed for, and written upon the advantages of a dry climate in consumption. There are other reasons why this may give benefit, but I suppose no one will contend that the fluids in the tissues of the lungs are materially lessened thereby, or that, while life continues, these can by any manner of means be so diminished as to prevent bacillary development. The heat-point for the bacillary growth must be maintained so long as the individual exists, for its reduction to a point to interfere with its development must be incompatible with the conditions possible for the maintenance of the life of the individual. Given, the depreciation of the vitality of the tissues locally, and that the albuminoids requisite to furnish food for the unwelcome tenants continue, and we safely infer, from what we now know, that an aseptic atmosphere, however, dry or rarefied, cannot alone furnish the factors of cure.

The rôle of bacterial reproduction varies greatly in certain diseases. Thus, in scarlet fever, measles, small-pox, once having run its course, the bacterial development is at an end, and only in the most exceptional conditions can be reproduced in the same individual. In a measure this is true of typhoid, typhus, and yellow fever, and also of diphtheria and perhaps other diseases. Remittent or malarial fever is an exception, and yet, after a time, the individual either takes on an increased resisting power to the disease, or the conditions necessary for its development are changed and so-called acclimitization follows. However, the residents of a malarious country never entirely escape its influence. That it is a new infection, rather than the development of the original seed, appears probable, since ordinarily a residence in a country free from malaria soon causes the disease to disappear. While thus much may be determined from experience, and the sufferers from this disease promised exemption by change of climate,

sufficient is not yet known of the rôle of the bacillus *malariae* from which to deduce more than the most general conclusions. Enough is known of the bacillus *tuberculosis* to show that it is found in all countries, making its greatest inroads in thickly settled communities and is most prevalent in cold, damp localities. This latter state may be considered favorable since, thereby, catarrhal conditions of the respiratory passages are induced, and thus a soil favorable for its development is produced. For similar reasons the general vitality, or resisting power of the individual is reduced. That the person thus subject to catarrhal inflammations should be greatly benefited by breathing an aseptic air is easily conceived, since such an individual residing in a city can scarcely escape the breathing of an infectious atmosphere.

Every pathologist knows that a considerably greater percentage of cures in consumption is effected than is generally believed. It is not rare to find localized, cicatricial and calcareous degeneration in the apices of lungs, otherwise healthy, which may be traced to disease incurred even in early life. If caused by bacilli, why did these cases recover? The answer must be, that the conditions for the proper development of the microbe did not pertain, that in some way the vital, resisting power of the tissues was superior to the invasion of the disease, that cells were proliferated, as a protective wall, so to speak, against the invasion of the microbe, which did not furnish the albuminous food necessary for its development. Thus shut in, the disease is necessarily limited and bacterial growth ceases.

Sée, in his recent treatise on "the Bacillary Phthisis," discusses at considerable length, the question of microphytic life, especially that of the bacillus *tuberculosis* in high altitudes; and considers such a climate of prophylactic character. Recent very interesting experiments, conducted in the pure air of the Adirondack region, show that the development of the

bacillus tuberculosis following inoculation and infection of animals does not in any wise differ from the laboratory experiments carried on in the large cities.

Dr. Harold Williams, of Boston, in a carefully prepared paper read before the Massachusetts Medical Society during the present year, reviews certain phases of the question of the adaptability of climate to individuals, and in summing up says: "It seems to me that we must admit, in the present state of our knowledge, the meteorological differences of climate have been proved to be of little importance in the treatment of phthisis; and, furthermore, that clinical evidence would support this conclusion, for the burden of proof lies with those advocates who plead in favor of special climates, and such proof it seems to me is yet to be forthcoming."

This is more than I am willing to admit, since we should look for aid to the infected individual from climatic change, not in the breathing of an "anti-bacillary atmosphere," but in the placing of the patient in surroundings suitable, if possible, to strengthen his weakened, vital, resisting powers, and reinforce his tissue development, so that it may be superior to the attack of the would-be destroyer, and although we do not know all the conditions requisite for counteracting the growth of morbilliferous bacilli, we are assured that healthy tissues and blood imperfectly furnish the required pabulum. Were it only necessary to breath an anti-bacillary atmosphere, science could solve the problem and give to the sick-chamber an antiseptic air fatal to bacterial growth. Many have builded hopes upon such remedial agents and, perhaps, in certain measure correctly; but, given a "pneumatic cabinet" and antiseptic inhalations, we should not expect to affect a diseased gland, a caseous nodule; and only in a certain limited degree, a cavity even, since the air inspired goes almost wholly into the less diseased and healthy portions.

When our present knowledge of infectious diseases is thus reviewed, are we to ignore, as some recent writers have done, the entire question of benefit to be obtained from climatic change? On the contrary, it appears, therefrom, that we have sufficient data by which to add, emphasize and encourage climatic investigations and confirm previous experience, even if the theories, under which it was sought, do not prove true. Equability and dryness of the air are certainly important, well recognised factors in the alleviation of the respiratory tract, and this alone is sufficient to make these conditions of value, in the selection of a residence for such invalids. Atmospheric moisture, in cloud or vapor, is detrimental by lessening the sunlight, and the clear skies of any land are justly prized. This is sometimes called the diathermacy of the atmosphere, and this is increased by the rarefaction of the air. Nearly every one has observed the intensified effect of the sun's rays at high altitudes.

Clinical observations teach that on the invalid able to endure it, active-out-of-doors exercise, in elevated localities, has an especial invigorating effect upon the respiratory function and apparatus; the circulation is improved, thereby increasing the oxydation of the tissues, as well as producing a better cellular nutrition and elimination of the effete material. The lowering of the atmospheric pressure also tends to diminish the circulation of the deeper tissues, which in certain conditions of the organs is of great importance—as for example, in renal, hepatic, or cerebral congestions—while, on the other hand, the blood-flow to the surfaces is greatly augmented, an important factor in conditions of defective, or perverted cutaneous nutrition. The effect of this is shown in increased appetite and improved digestion, until the imperfectly prepared food, too often forced by necessity, to supply the demand, is taken with a relish

never known at home, and digested without knowledge of organs or processes.

With a labor only known to those who have worked in such direction, Dr. Denison has utilized the mass of statistics gathered by the Signal Service Department, and placed before the profession his seasonal maps of the United States. These are worthy the careful study of every physician, and teach many facts of the greatest importance. Under date of June, 1885, he writes in regard to Colorado: "In my practice of twelve years in Colorado, it has been very seldom that I have known of the origination of phthisis here, and with the carefully kept records of nearly twelve hundred cases of asthma, phthisis, chronic pneumonia, etc., I do not remember to have written a certificate of death for one uncomplicated case of phthisis originating in Colorado. Of course there are such cases; I have one under my care at the present time. As civilization progresses here, it will not be strange if the disease becomes much more frequently met with in thickly settled districts, made up as they are of a considerable scattering of regenerated invalids. . . . The weight of evidence is so decidedly in favor of elevation as an important factor in the climate for the consumptive, that it will not answer for any one who has not personally investigated the Rocky Mountain regions, or similar elevated resorts, to say that nothing has been proved for elevation. Everything has been proved; since all the most desirable attributes, dryness, coolness, sunshine, stimulation of increased atmospheric electricity, sandy soil, perfect drainage, and last, but not least, *purity of atmosphere*, are found and increased with elevation above the sea level."

Dr. H. Weber, in his excellent *résumé* of the subject of climatic treatment of phthisis given in the Croonian lectures; published in the *British Medical Journal* during the present year, emphasizes the advantage gained by the invalid not only from ele-

vation, but also by the cold, dry air, and makes the distinction that in the sunshine the coldness pertains rather to the atmosphere than to the individual. Speaking of his personal experience in the high Alps in November, at the elevation of 10,000 feet, without an overcoat, he says: "As long as I remained in the sunshine I never felt warmer in August or September in the same localities; but in the shade an overcoat would have been just a comfort, though I did not feel cold, in spite of a temperature of only 20° to 25° F., the air being perfectly calm. A black bulb thermometer *in vacuo*, showed in the sun between 88° and 92° F., while an ordinary thermometer registered only between 31° and 32° F." He sums up the advantages attained in mountain health resorts to be as follows: "1st. The atmospheric purity or aseptic nature, the comparative absence of floating matter. 2d. Dryness of the air and soil, comparative absence of mist. 3d. The coolness of the air-temperature and the great warmth of the sun-temperature. 4th. The rarefaction and low pressure of the air. 5th. The intensity of the light. 6th. The stillness of the air in winter. 7th. A large amount of ozone. The effects on the invalid suited to such climates are, increase of appetite, improvement of sanguification and general nutrition, strengthening of the heart and circulation, raising of muscular and nervous energy and of activity of the skin."

Observations have been made in some of the South American high altitude stations, as at Janja, of more than 10,000 feet above the sea. The range of temperature during an entire year was between 50° and 60° F., with the sky always clear and sunny, and an atmosphere pure and bracing, which invites to out-of-doors exercise and enjoyment. In an atmosphere as cold as the winter in the Alps or the Rocky mountains, it is essential to select localities where protection from wind is attained, since the motion of an atmosphere thus cold abstracts heat rapidly. In

broad stretches of equable cold, the winds are reduced to a minimum and the absence of moisture greatly increases the hours of sunshine.

The chief objection to the Rocky Mountain health resorts lies in the distance from the centres of population. The White Mountain region affords a very considerable elevation, but, judged in the light of the above experience, too little to secure much good from the rarefaction of the air, since Bethlehem is the higher location of the villages, and this is only 1,800 feet above the sea level.

The Adirondacks are of less elevation, but possess the advantage over the White Mountains in being sparsely inhabited, an almost unbroken forest, an elevated plateau furnishing an equable, cool summer and a decidedly cold winter climate. Through the influence of Dr. Loomis, of New York, a sanitarium has been established for patients to remain the entire year, and good results have been attained; but it is difficult of access, and offers very little advantage from rarefaction of the atmosphere.

The mountains of the Alleghany range have been known to some extent as affording interesting and health-giving resorts for summer recreation, and in the southern ranges furnishing summer homes for the residents of Southern States. The entire range is free of malaria, and Ashville, in Western North Carolina, has grown to a village of about five thousand inhabitants, chiefly as a summer resort. The Alleghanies divide, in the northern part of North Carolina, into the Blue Ridge and the Smokies, the latter the boundary line between that State and Tennessee. The triangle thus formed, with South Carolina and Georgia on the south, is filled with cross ranges of mountains and comprises a territory of about fifty thousand square miles. The entire section is elevated in the bed of the streams, or valleys, to about two thousand feet above the sea, and presents a most irregular surface; a sea of mountain peaks, ranging

from three thousand to six thousand feet in height. Within an area of fifty miles there are twenty peaks over six thousand feet high; nine-tenths of the entire district is an unbroken, primeval forest of the largest growth, chiefly of deciduous trees. It is the oldest geological formation on the continent, of granitic character, and gives the most unmistakable evidence of the corroding tooth of time. Not a lake or a swamp is to be found in the entire region, a fact perhaps without a parallel for an area of equal extent in the world. Feldspar is the predominating factor in the granite, and, owing to its easy decomposition, the rocks have worn more rapidly, giving an excellent soil for tree growth and the purest of water, as seen in an endless series of pearly, musical rivulets.

With a sparse population, such soil and water, there cannot be otherwise than a pure atmosphere. Owing to the difficulties of making railroads in such a mountainous country, until quite recently, the larger portion of this region has been more inaccessible than Colorado, and no part of the United States, east of the Mississippi, equally large, is probably today so little known, or possessed of equal natural advantages, so entirely undeveloped.

The possible advantages of a winter residence in this section has, until recently, been untried. Within the last two or three years I have sent a considerable number of invalids to Ashville and other localities, for the most part with excellent results. Owing to my own favorable impressions, I personally surveyed this triangle during the past summer, making several hundred miles on horseback and in carriage. I am indebted to a large number of resident physicians, whose uniform courtesy I am glad to acknowledge, for many of the facts upon which my deductions are based.

Ashville was the central point of observation. Its popularity is likely to prove its ruin as a health resort; too large for a country village, with its purity

of surroundings, too small to secure the advantages from sewerage and an uncontaminated water-supply. Its large hotels are badly located in the centre of the business portion of the town, and its beauty of situation is its chief recommendation. Twenty-three hundred feet above the sea, it is splendidly situated on rising ground, with a distant amphitheatre of mountains. As a winter resort it possesses the advantages derived from its southern location, giving a mild climate, not unlike the South of France. From observations now made for a number of years, the mean average of temperature at Ashville is: Spring, 52.3° , summer, 71.3° , autumn, 55.3° , winter, 37.2° ; year, 55.3° .

Average rain-fall, 40.02 inches; during a period of eight years the thermometer but twice rose above 88° , and only three times fell below 3° . Ashville has offered, hitherto, the essential advantage of being of greater altitude than any other Southern health-resort of easy reach by rail, with a dry, pure, and invigorating air; in winter a remarkable freedom from rain and cloud, with warm sunshine; in summer never oppressive heat, and cool nights. Rain makes of the clayey loam a tenaceous mud, which often seriously interferes with out-of-doors exercise.

Dr. H. P. Gatchel, of Ashville, who has for years made a careful study of the climate, writes: "The climate of Ashville is no Eden climate. It partakes more or less of the variableness that pertains to the most of our territory. It has some severe winter days and some blustering March weather; but it is on the whole the best climate we have. If it lacks the uniform mildness of a portion of California, it does not, on the other hand, beget that excessive sensitiveness which is engendered in California. It develops a more robust constitution. It seems to afford a favorable medium between the enervating influence of the warm or uniformly mild regions and the overpowering cold of high Northern latitudes.

The snow seldom remains many days at a time, even on the high mountains, and its stay in the valleys can generally be measured by hours. The climate of Western North Carolina would be still more desirable if the rain of winter were less than it is. But though this is considerable as compared with the dry interior beyond the ninety-fifth meridian, yet compared with Cincinnati, Louisville, Nashville, and Knoxville, it is moderate. Indeed, the universal testimony of all competent observers establishes the existence of a dry, invigorating atmosphere; the neighboring mountains serving to intercept much of the moisture, and to cause its deposition on the summits and outer slopes. The average rainfall in inches of the different seasons for a period of eleven years is shown to be as follows:

Spring.....	10.1	inches.
Summer.....	13.5	"
Autumn.....	7.1	"
Winter.....	9.5	"
Total	40.2	inches."

Below, on the French Broad River, are the Warm Springs, noted even by the Indians for their curative powers. Westward, at an elevation of twenty-seven hundred feet, is Waynesville, an enterprising town, but here the valley is rather narrow, especially up the Richland Creek, where are located the White Sulphur Springs, justly popular as a summer resort, since the scenery is surpassingly lovely. Beyond here the broken ranges extend westward for a hundred miles in picturesque beauty of forest and mountain, but without a single hotel where an invalid can be even comfortable.

If tuberculosis is dependent upon the development of a bacillus, then the orthodox belief in the heredity of consumption is subject to revision and modification. In evidence upon this question, I quote from a recent letter written by Dr. Oliver Hicks, of Rutherfordton, N. C.: .

I have made observations in regard to pulmonary diseases generally, and hereditary tubercular phthisis especially, to which I wish to call your attention, and which I know will influence you in selecting a place of refuge for your phthisical patients. My observations and the opinions I have formed are based upon a large practice for twenty years. I can show you sons and daughters of ancestors who came to this country and died from tubercular phthisis. Many of them are far past the meridian of life, and are in good health, with fair prospects of attaining to ripe old age. The grandchildren of these ancestors are in all respects healthy, and are entirely without indication of tubercular or strumous cachexia."

The Tuckaseege and Little Tennessee rivers water beautiful, wide, elevated valleys, with out-stretching expanse of surrounding forest. Their headwaters are in the mountains, which form the dividing chains between South Carolina and Georgia. A considerable village, called the Highlands, has been advertised extensively as a health resort. It is situated on a broad plateau, covered with oak growth, at an elevation of about four thousand feet, but it is of very difficult access for invalids, being fifty miles from the Western North Carolina railroad and about thirty from rail in South Carolina. The roads are never good, and at times well-nigh impassable. The rainfall here is excessive, being over seventy inches yearly average for the two years during which observations have been made. The changes of temperature are sudden, and during much of the summer, clouds and rain prevail. The cooler elevations cause condensation of rain from the moisture-laden winds blowing from over the heated lower lands stretching away to the East and South.

Westward is the Nantahala Valley, which is less a valley than a plateau, between the ranges about three thousand feet in elevation. Twenty miles by fifty long, it lies in picturesque loveliness, an almost un-

broken forest. Beneath the great arches of wide-stretching birches, maples, and oaks, runs the beautiful river, giving name to the valley, making rippling, laughing music in its merriest mood, flecked with sunshine and shadow, between its banks festooned with thick hedge of kalmia and rhododendron; the wild-est, most secluded spot east of the Rocky Mountains. The rail will soon reach this valley, and the time will come when the attractions of this locality will draw thousands to enjoy and profit by a sojourn amid these mountains.

Farther to the north are the splendid ranges, culminating in the Black, the Roan, the Yellow and Grandfather mountains. The growths upon the upper heights are decidedly Alpine in character and afford a greater variety in plant-life than any other localities in the United States. On top of the Roan, General John B. Wilder has erected a hotel, with accommodations for from four to five hundred guests. Next year the visitor is promised the ascent by a steam-cable-road in connection with the railroad from Johnston City in East Tennessee. The Roan is 6390 feet above the sea and is the highest inhabited spot east of the Rocky Mountains. The temperature has been found to be exceedingly equable and the electrical condition of the atmosphere is claimed to offer certain advantages. This large hotel has been erected in the belief of great benefit to be derived from a considerable long residence here, based upon the experience of several years during which period a small hotel became very popular.

An interesting condensed weekly record is the following from the report of James E. Burnett, U. S. Survey Officer, for the three months ending Oct. 15, 1885, station top of Roan Mountain, N. C. Observations were taken at 6 A.M., noon, and 6 P.M. daily. It is to be regretted that the amount of rain-fall and clear weather was not recorded:

TIME.		Bar.	Ther.	D. B.	W. B.
1st week —	Highest.....	24.363	68	65	
"	Lowest.....	24.225	56	42	
"	Average.....	24.285	61.2	56.8	
2d week —	Highest.....	24.303	67	65.5	
"	Lowest.....	24.176	57	56	
"	Average.....	24.253	62.7	61.4	
3d week —	Highest.....	24.203	66	62	
"	Lowest.....	23.964	48	47.5	
"	Average.....	24.110	59.5	57.3	
4th week —	Highest.....	24.292	65.5	64.5	
"	Lowest.....	24.173	51.5	50.5	
"	Average.....	24.228	59.6	58.1	
5th week —	Highest.....	24.254	66.5	65	
"	Lowest.....	24.036	50	49	
"	Average.....	24.138	58.3	56.9	
6th week —	Highest.....	24.251	75	65	
"	Lowest.....	24.136	53	51.5	
"	Average.....	24.202	59.5	56.8	
7th week —	Highest.....	24.266	70	65	
"	Lowest.....	24.024	41	39	
"	Average.....	24.137	56.8	58.4	
8th week —	Highest.....	24.236	61.5		
"	Lowest.....	24.070	44		
"	Average.....	24.134	52.4		
9th week —	Highest.....	24.200	64	61	
"	Lowest.....	24.016	51	50	
"	Average.....	24.131	50.6	55.2	
10th week —	Highest.....	24.274	61	62	
"	Lowest.....	24.020	44	42	
"	Average.....	24.163	56.7	51	
11th week —	Highest.....	25.324	64	62	
"	Lowest.....	23.984	48	44	
"	Average.....	24.191	49.5	51.8	
12th week —	Highest.....	24.272	59	58	
"	Lowest.....	23.816	35	35	
"	Average.....	24.069	47	45	

Prof. Muttrich, of Berlin, has reached the following conclusion from his forest meteorological researches: "That the forest exercises a positive influence on the temperature of the air; that the daily variations of temperature are lessened by the forest, and in summer more than in winter; that the influence of the leafy forest in summer is greater than that of the pine forest, while in winter the tempering influence of the pine forest preponderates over that of the defoliated forest."

So far as I have been able to learn, no studies of a general sanitary character have been made upon this elevated region of the southern Alleghanies.

The first writer on the climate of this region was John Rawson, Surveyor-General of North Carolina.

His history was printed in 1714 and reprinted in 1860 at Raleigh, N. C. He states: "The climate is very healthful, our summer is not so hot as in other places to the eastward in the same latitude. . . . Our sky is generally serene and clear, and the air very thin in comparison with many parts of Europe, where consumption and catarrh reign among the inhabitants. The winter has several fits of sharp weather, especially when the wind is northwest, which always clears the sky, though never so thick before. However, such weather is very agreeable to European bodies, and makes them healthy."

The first scientist who probably visited this region was William Bartram, the botanist, who explored these ranges in the service of the distinguished Dr. Fothergill, of London, in 1772, and published the ever interesting report of his travels, in a now rare book, in London in 1778. He never tires of repeating his delight in the beauties of the landscape, the diversity and magnificence of the vegetation, and declares that the Indians, both male and female, are among the finest specimens of physical development he has ever seen of any nationality.

F. A. Michaux, M.D., also an enthusiastic botanist, gives an interesting account of his travels and collections, which was translated and published in London in 1805. He says: "These mountains are getting inhabited very rapidly. The salubrity of the air, the goodness of the water, etc., are the causes which attract new settlers hither."

Prof. Asa Gray, of Cambridge, reports at considerable length an extensive botanizing tour made in 1841 in the mountains of North Carolina. He reviews the labors of the previous explorers, and adds much interesting information of a general, as well as of a special character. This is found in the *American Journal of Science* for April, 1842. The late Prof. C. W. Kerr, State Geologist of North Carolina for many years, wrote: "By reference to the Sanitary

Department of the Census Report of 1870, it will be seen that one of the two or three most healthy localities in the United States is found in the western part of North Carolina, in the Blue Ridge region. Indeed, it would be difficult to find a more salubrious climate in the world than the whole mountain section." Of the recent writers, no one has contributed so much of general information and value as Ziegler and Grosscup, in their work entitled "In the Heart of the Alleghanies."

In the Smithsonian Reports for 1856, the late Silas McDowell first called attention to and discussed the thermal or "no frost" zone. There are certain considerable localities where frost is unknown, and the seasons, in their vegetation, are quite unlike the adjacent slopes. Often in the early spring it is manifest as a green band across the side of a mountain before elsewhere apparent. The explanation is the peculiar conformation of the slopes, which modifies the atmospheric currents. Sections of this zone are found upon almost every spur of the Blue Ridge south of the Catawba River. The season is as long as in South Carolina, while the summer heat is not higher than that of New York. No reports from invalids residing in these localities have come to notice, as far as known, but the absence of frost at these elevations adds a very important factor to the rarefaction of the atmosphere, now sought as essential in certain conditions of pulmonary disease of the entire region.

The water is pure and abundant, springs bubble up from every mountain-side and clear, crystalline streams run musically through every valley. Medicinal waters, sulphur and iron springs, are not rare. One great benefit to invalids of all classes lies in the purity of the air, which the extraordinary forest-growth does much to render equable in temperature and moisture. Dust is unknown. The electrical phenomenon of the summer storms is exceptional; a highly ozonized at-

mosphere results therefrom. Notwithstanding the utter disregard of laws of health by the inhabitants, they are a long-lived race of people. One intelligent man, past 80, but looking scarcely 60, who delighted in statistics, gave me these, which he had gathered in Macon County: With a population of about ten thousand, 136 individuals still living aggregated in age 10,667 years. Of the number 26 men, 2,215 years, average 85+ years; 21 women, 1,823 years, average 86+ years; one woman living now in her 107th year.

The absence of mosquitoes, gnats and black flies will speak volumes in favor of these mountain forests to those who have sought recreation in the wilds of our border lands in any direction. The lack of civilizing comforts is the present drawback, and the invalid who ventures a residence in these remote mountain recesses must provide for himself nearly everything approaching a luxury. The lover of nature of either sex will find plenty to occupy and fill the hours with delightful study. It is, however, no place for one seriously ill, and the chronic grumbler will never want for occasion to exercise his spleen. The absence of good roads and bridges makes locomotion difficult. The saddle offers the best of exercise and the surest means of travel, but the railroads approaching from every direction give promise of a new era. The mineral wealth, forest growth and productive soil are in evidence of material prosperity to come. The pure air, water and climate hold out a hopeful helpfulness to invalids from every land. The wise legislator, seeking far-reaching results, would do well to consider the advisability of securing, under State control, a large reservation of the higher ranges as a park. Its cost, at present, would be merely nominal. Like the peaks and glaciers of Switzerland, its indirect returns of monetary gain would be more sure than bonded interest, and its sanitary advantages would be of a value incalculable to millions yet unborn.

116 Boylston St., Boston, December, 1885.

